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# A REVIEW ON OPTIMAL METHODS FOR IRIS RECOGNITION

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## ABSTRACT

The iris recognition is a kind of the biometrics technologies predicated on the physiological characteristics of human body, compared with the feature apperception predicated on the dactylogram, palm-print, face and sound etc, the iris has some advantages such as uniqueness, stability, high apperception rate, and non-infringing etc. Iris apperception is regarded as the most reliable and precise biometric identification system available. In this paper, we will describe the common methods of Iris Recognition along with some feature extraction techniques and matching methods. This paper will help if future in choosing the best optimal method for Iris Recognition.

**KEYWORDS:** Iris, Wavelets, Hamming, Gabor, Matching, Feature Extraction

## INTRODUCTION

Now a days, one of the main threats that IT system and security environment can have, is the possibility of intruders in the system. This is normally solved by user authentication schemes based on passwords, secret codes and identification cards or tokens. Biometric solutions, such as identification systems using fingerprint, iris, face, and palm print, hand geometry, signature, etc; have many advantages over the traditional authentication techniques based on what you know or what you possess. Instead of carrying bunk of keys, all those access cards. Therefore nowadays many automatic security systems based on iris recognition have been deployed worldwide for border control, restricted access and so on. This technique performs better identification than other biometric.

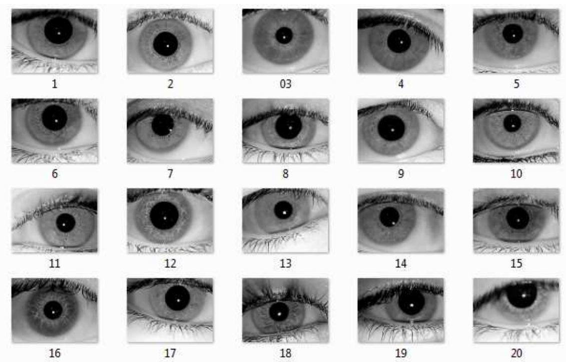


**Figure 1: Iris Database from IIT**

The rest of the paper is organized as follows. Section II provides an overview of existing iris recognition methods. Section III presents the general system model of Iris Recognition, Section IV and Section V will describe the feature extraction and matching methods. Finally, the paper is concluded in Section VI.

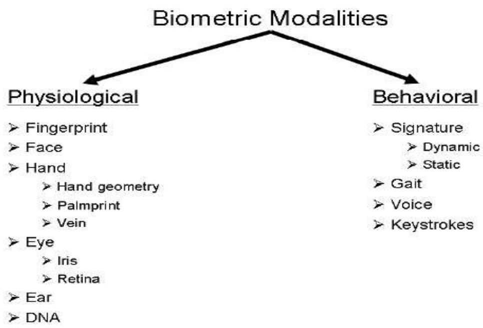


**Figure 2: Biometric Modalities**

## LITERATURE SURVEY

- This paper proposes to ameliorate performance of the system and authenticity of a biometric system. It evaded normalization process used traditionally in iris apperception systems. The technique which is proposed here used various different masks to filter out image of iris from an ocular perceiver. Comparative research of these various different masks was done and enhanced mask was proposed. The observation was carried on CASIA database consisting of 756 iris images of 108 persons. Each person gives 7 images of ocular perceiver (108×7 = 756) images in the database.
- This paper proposes that the Iris pattern is a consequential biological feature of human body. The apperception of an individual predicated on iris pattern is achieving more popularity due to the uniqueness of the pattern of iris among the people. In this paper PCA predicated iris apperception utilizing DWT (PIRDWT) is proposed. The top and bottom portion of the iris which is occluded by the ocular lids and ocular lashes is abstracted utilizing semantic process. According to Springer Observation of CASIA database, to have more preponderant apperception 45 pixels to left and right of the pupil boundary is treated as iris template for the proposed algorithm observation. The picture is intensified utilizing Histogram Comparison to get high disparity. DWT is tested on histogram equalized iris pattern to get DWT coefficients. Multiple classifiers such as KNN, RF and SVM are utilized for matching. The proposed algorithm has more preponderant performance parameters compared to subsisting algorithm. This paper presents that the biometric identification systems, which use physical features to check a person’s identity, ascertains much more preponderant security than password and number systems. Multibiometric system is being increasingly deployed in much large scale application because they provide lower error rate, large population coverage compared to unibiometric. In this paper, multibiometric identification system aim to fuse iris n fingerprint traits. During enrollment stage system generate iris n fingerprint template separately n stored in database. Approach for fingerprint recognition is to extract minutiae from fingerprint images. It makes possible to achieve highly robust fingerprint recognition for low-quality fingerprints. During iris recognition images are segmented, normalized and features are extract by using Log-Gabor filter. Finally matching is done with help of hamming-distance. Once both iris n fingerprint template are match separately scores are combined by using sum rule-based score level fusion which increase the recognition rate. Thus improve system accuracy and dependability
- This work shows that the fingerprint and Iris are the most unique features because it is unchangeable anywhere most of the time, compare to other biometrics. In the proposed approach 5 steps are followed in enrollment phase

i) Feature extraction of fingerprint and iris ii) Fusion of extracted features iii) Key is engendered from the fused feature which is of more preponderant than 128 bit which is enough for AES encryption iv) AES encryption v) Hash Encoding vi) AES decryption. Message is subjected to hash and hash of message is obtained and it is given to AES encryption as a message and the key is obtained from the fused feature. In the verification phase, decryption is to be done. Message is obtained when the encrypted value from the enrollment phase and verification phase are same. Fingerprint is obtained from publicly available sources and Iris is obtained from CASIA Iris database. From this system performance of False acceptance rate and False rejection rate are highly reduced.

- This work shows that it is very paramount for the performance evaluation of iris apperception algorithms to construct profoundly and astronomically immense iris databases. However, circumscribed by the authentic conditions, there are no prodigiously and sizably voluminous prevalent iris databases now. In this paper, an iris image synthesis method predicated on Principal Component Analysis (PCA), Independent component analysis (ICA) and Daugman's rubber sheet model is proposed. Iris Apperception is a rapidly expanding method of biometric authentication that utilizes pattern-apperception techniques on images of iris to uniquely identify an individual. Algorithms have proven to be increasingly accurate and reliable after over 200 billion comparisons. The aim of this group project is to implement a working prototype of the techniques and methods used for iris recognition. Here we are comparing results of all three algorithms and showing the best technique used for iris recognition. As we are using three different algorithms the efficiency of project increases.
- In this paper, the author introduces an approach for personal identification predicated on iris apperception utilizing Genetic algorithm and Neural Network. This approach of iris apperception consists of localization of the iris region and formation of data set of iris pictures followed by iris template apperception. A Neural Network is utilized to reduce the low apperception rate, low precision and incremented time of recuperation. Here the genetic algorithm is utilized to enhance the parameters of Neural Networks. The imitation results show a good recognition rate and reduced practice time.

## GENERAL SYSTEM MODEL

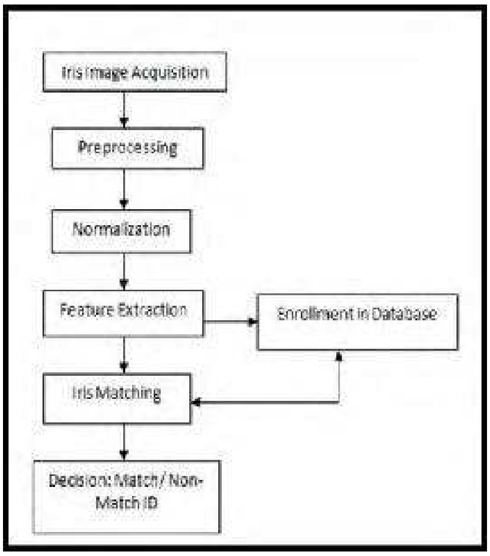


**Figure 3: General Model**

# 1. COMMON FEATURE EXTRACTION METHODS

## 1.1 ICA

Independent component analysis (ICA) is a mathematical and arithmetic technique for revealing obnubilated factors that underlie sets of arbitrary variables, quantifications, or signals. ICA defines an abundant model for the recognized multivariate data, which is frequently given as a sizably voluminous database of samples. In this model, data variables are surmised to be continuous mixtures of some obscure dormant variables, and the commixing system is withal unknown. The dormant variables are assumed non-Gaussian and commonly autonomous and they are called the independent components of the recognized data. These independent components can be established by ICA. ICA is outwardly cognate to PCA and factor analysis. ICA is much more potent approach, however, able to find the latent factors when these typical methods fail exhaustively. The content examined by ICA could arise from various different kinds of operational fields, including digital images, document databases, economic designators and psychometric quantifications. In many cases, the quantifications are accustomed as a set of parallel signals or time series; the phrase blind source disseverment is utilized to characterize this quandary. Typical examples are mixtures of simultaneous verbalization signals which are picked up by several microphones, brain waves documented by multiple sensors, meddling radio signals arriving at a mobile phone.

The two broadest definitions of independence for ICA are

- Minimization of mutual information
- Maximization of non-Gaussianity

## 1. 2 GA (Genetic Algorithm)

### 1. 2. 1 Selection

During each successive generation, a proportion of the subsisting population is culled to breed an incipient generation. Individual solutions are culled through a fitness-predicated process, where fitter solutions (as quantified by a fitness function) are typically more liable to be culled. Certain cull methods estimate the fitness of all solutions and conversely cull the best solutions. Other methods estimate only a desultory model of the population, as the old process may be very time-absorbing. The fitness function is described over the genetic representation and measures the aspect of the described solution. The fitness function is consistently quandary dependent.

### 1.2.2 Genetic Operators

The next step is to engender a 2nd generation population of solutions from those culled through a cumulation of genetic operators: crossover and mutation.

For each incipient solution to be engendered, a dyad of "parent" solutions is culled for breeding from the pool culled a foretime. By engendering a "child" solution utilizing the above methods of crossover and mutation, an incipient solution are engendered which consistently shares many of the features of its "parents". Incipient parents are culled for each incipient child, and the process perpetuates until an incipient population of solutions of congruous size is engendered. Although reproduction methods that are predicated on the utilization of 2 parents are more "biology inspired", some study suggests that more than 2 "parents" engender better quality chromosomes. These methods eventually result in the next generation population of chromosomes that is dissimilar from the previous generation

### 1. 2. 3 Termination

This generational process is reiterated until an end condition has been reached. Common ending conditions are:

- A solution is found that satisfies minimum criteria completely.
- Fixed number of generations reached
- Allocated budget (computation time/money) reached
- The highest ranking solution's fitness is extending or has extended to a level such that subsequent redundancy no longer engender more preponderant results
- Manual inspection
- Combinations of the above

### 1. 2. 4 Haar Wavelets

Division of regions into components takes place that appear at different resolutions. Wavelets have the advantage over traditional Fourier transform in that the frequency data is localized, allowing features which occur at the same position and resolution to be matched up. A number of wavelet filters, also called a bank of wavelets, is applied to the 2D iris region, one for each resolution with each wavelet a scaled version of some basis function. The output of applying the wavelets is encoded in order to provide a compact representation of the pattern of iris. The Haar wavelet is one of the simplest wavelet transforms which can transform huge data sets to considerably smaller representations. Here we utilize Haar wavelet transform which extracts the features from the iris area. De-composing images with wavelet transform yields a multi-resolution from detailed image to approximation images in each level. If images of size N x M are taken then it is decomposed up to K th level where K= 1, 2, 3 etc. The quadrants (sub-images) within the image indicated as LH, HL, and HH represent detailed images for horizontal, vertical, and diagonal orientation, respectively in the first level. The sub-image LL corresponds to an approximation image that is further decomposed, resulting in two-level wavelet decomposition.

### 1. 2. 5 Gabor Wavelets

In recent years, Gabor filter based methods have been widely used in computer vision, especially for texture analysis. Gabor elementary functions are Gaussians modulated by sinusoidal functions. It is shown that the functional form of Gabor filters conforms closely to the receptive profiles of simple cortical cells, and Gabor. To know the concept of Gabor filtering, we must begin with Gabor wavelets. Gabor wavelets are formed from 2 components, a complex sinusoidal carrier and a Gaussian envelope.

## 2. MATCHING TECHNIQUES

### 2.1 Hamming Distance

For matching, the Hamming distance was culled as a metric for apperception, since bit-sagacious comparisons were obligatory. The Hamming distance algorithm employed withal incorporates noise masking. Hamming distance are calculated between two templates by using only important bits. Now by taking the Hamming distance, in pattern, only those bits that corresponds to ‘0’ in noise masks of both iris patterns will be utilized in the calculation. The Hamming distance will be calculated utilizing only the bits engendered from the precise iris region, and this modified

by each template. Although, in theory, hamming distance is 0 when the result calculated on same iris templates but in put into practice this will not occur.

**Formula:** Given two vectors u, v ∈ Fn we define the hamming distance between u and v, d(u, v), to be the number of places where u and v differ. Thus the Hamming distance between two vectors is the number of bits we must change to change one into the other.

E.g. distance between the vectors 01101010 and 11011011.

01101010

11011011

They differ in four places, so the Hamming distance d (01101010, 11011011) = 4.

**2. 2 Mahalanobis Distance**

The Mahalanobis distance is a quantification of the gap between a point P and a distribution D, introduced by P. C. Mahalanobis in 1936. It is a multi-dimensional observation of the conception of quantifying how many standard deviations away P emanates from the mean of D. The distance is zero if P is at the mean of D, and grows as P steps away from the mean. Along each PC axis, it portions the number of standard deviations from P to the mean of D. If this entire axis is re-scaled to have one variance, then Mahalanobis distance resembles to standard Euclidean distance in the transformed space. Thus, Mahalanobis distance is scale-invariant and unit less.

## CONCLUSIONS

Iris recognition is one of the most effective biometric techniques used for security purposes. In this paper various feature extraction and matching techniques has been discussed. This paper will lead to future citation.

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